

“CLIMATE EFFECTS” OF EPA’S FINAL CLEAN POWER PLAN

On August 3, 2015, EPA released the final version of its Clean Power Plan. EPA estimates that the Clean Power Plan will cost between \$5.1 billion and \$8.4 billion in 2030.¹ Our paper quantifies three climate effects that would result from the Clean Power Plan, specifically, changes in atmospheric carbon dioxide (CO₂) concentrations, global temperature, and global sea level rise.

SUMMARY

Our analysis is based on EPA’s projections for a 2012 rulemaking, and we assume for the sake of argument that those projections are accurate. Our analysis shows that the following climate effects caused by EPA’s Clean Power Plan are meaningless:

- Atmospheric CO₂ concentrations are reduced by 0.2%.
- Global temperature is reduced by 1/100th of a degree Fahrenheit (0.01°F).
- Sea level rise is reduced by 0.20 millimeter — the thickness of one to two human hairs.

These climate effects are even smaller than those we estimated for the proposed Clean Power Plan.²

METHODOLOGY

In 2012, EPA assessed the climate impacts of proposed greenhouse gas (GHG) emission standards for light-duty vehicles. EPA’s Regulatory Impact Assessment (RIA) for that rule included annual projections of GHG emission reductions resulting from the vehicle standards, and estimated the effect of those reductions on global average CO₂ concentrations, global average temperature, and sea level rise.³ According to EPA’s analysis, the cumulative CO₂-equivalent⁴ reductions from the light-duty standards total 10.61 billion metric tons (tonnes) over the period 2017 to 2050. For 2050, the RIA projects that the EPA standards will reduce the Intergovernmental Panel on Climate Change’s (IPCC) projected atmospheric CO₂ concentration by 1 ppm, reduce global mean temperature by a maximum of

0.006 degree Celsius (°C), and reduce sea level rise by as much as 0.02 centimeter (cm), or 0.2 millimeter (mm). EPA acknowledged in its RIA that “... modeling results of the impacts of this [light-duty vehicle] rule alone show small differences in climate effects.”⁵ Below, we explain the steps we followed to quantify the same three climate effects resulting from the Clean Power Plan.

STEP 1 — DETERMINE CUMULATIVE EMISSION REDUCTIONS

We use EPA’s projections⁶ to calculate cumulative CO₂ reductions through 2050 from the U.S. electric sector under the final Clean Power Plan. The Clean Power Plan includes two options for compliance: one based on each state meeting an emissions rate goal; the other based on each state meeting a mass-based goal. We use the mass-based option because it results in the largest emission reductions and, therefore, maximizes the potential effects. We also cap electric sector CO₂ emissions after 2030, another assumption that increases the potential effects of the rule. This approach results in a cumulative reduction of 10.34 billion tonnes of CO₂ from the electric sector over the period 2016 to 2050.

STEP 2 — CALCULATE CLIMATE RATIO

Next, we calculate (1) cumulative CO₂ reductions from the U.S. electric sector divided by (2) cumulative CO₂-equivalent reductions from EPA’s light-duty vehicle rule, which is 0.98 (10.34 billion-tonne reduction from the electric sector divided by 10.61 billion-tonne reduction from light duty vehicles). The cumulative reductions are almost the same under the two EPA rules, so the climate effects are almost the same too.

STEP 3 — ESTIMATE CLIMATE EFFECTS

We assume, solely for the sake of argument, that EPA’s climate modeling is accurate, and we calculate climate effects as the product of (1) the climate ratio (0.98 above) and (2) each of the three climate effects from EPA’s light-duty vehicle rule. For example, the atmospheric CO₂ concentration under the Clean Power Plan will be reduced by 0.98 ppm (1 ppm x 0.98) by 2050. Applying the same ratio to the change in global temperature and sea level rise that EPA projected for its light-duty vehicle rule, we estimate the following climate effects for 2050 due to the Clean Power Plan:

- Average global CO₂ concentration will be reduced by 0.98 ppm — or about 0.2% — in 2050. The current atmospheric CO₂ concentration is approximately

400 ppm, and the IPCC projects CO₂-eq concentrations will be approximately 450 ppm to 600 ppm by 2050.⁷

- Global average temperature will be reduced by 0.006°C (0.010°F). The IPCC projects a global temperature increase of 1.0°C to 2.0°C (1.8°F to 3.6°F) in 2050.⁸
- Sea level rise will be reduced by 0.20 mm — the thickness of one to two human hairs, two sheets of paper, or two \$1 bills.⁹

CAVEAT

Our use of EPA's analysis to estimate these climate effects does not imply an endorsement of EPA's assumptions or conclusions.

SIMILAR PROJECTIONS

Since our original estimates last year of the climate effects of the proposed Clean Power Plan, others have also modeled the climate impacts of EPA's proposed Clean Power Plan and found results similar to ours. The Cato Institute used the MAGICC climate model to project that the proposed Clean Power Plan would have reduced global average temperature by 0.02°C by 2100.¹⁰ NERA Economic Consulting ran the DICE model and found that the proposed Clean Power Plan would have reduced global temperature by a maximum of 0.003°C by 2030.¹¹ Similarly, we estimated that the proposed Clean Power Plan would have lowered average global temperature by 0.009°C by 2050.

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¹ U.S. EPA, *Regulatory Impact Analysis for the Clean Power Plan Final Rule*, August 2015, page ES-9.

² ACCCE, *Climate Effects Issue Paper*, June 2014. These estimates of climate effects for the final Clean Power Plan are smaller than those we calculated last year for the proposed rule. The major reason for the smaller effects is that EPA's projected "business as usual" CO₂ emissions from the power sector are lower than last year's projections, so the cumulative emission reductions are less.

³ U.S. EPA, *Regulatory Impact Analysis: Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards*, August 2012. EPA also estimated changes in ocean pH.

⁴ CO₂-equivalent (CO₂-eq) represents the climate impact of non-CO₂ greenhouse gases converted to CO₂-equivalent emissions based on their relative global warming potential.

⁵ U.S. EPA, *Regulatory Impact Analysis: Final Rulemaking for 2017-2025 Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards*, August 2012, page 6-115.

⁶ EPA Analysis of the Clean Power Plan, IPM Run Files, *EPA Base Case for the Clean Power Plan*, Base Case State Emissions spreadsheet; *Rate-Based*, Rate-Based State Emissions spreadsheet; and *Mass-Based*, Mass-Based State Emissions spreadsheet, accessed August 4, 2015.

⁷ National Oceanic and Atmospheric Administration, Earth System Research Laboratory, *“Recent Monthly Average Mauna Loa CO₂.”* The concentration in June 2015 was 402.8 ppm CO₂. IPCC, *Climate Change 2013: The Physical Science Basis: Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Chapter 1, page 148-149.

⁸ IPCC, *Climate Change 2013: The Physical Science Basis: Working Group I Contribution to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change*, Chapter 12, pages 1054-1055.

⁹ 20-pound office paper is 0.004 inches or 0.10 mm thick, *“Paper Thickness Chart,”* www.casepaper.com. A single \$1 bill is 0.0043 inches, or 0.10 mm thick, hypertextbook.com, citing Bureau of Engraving and Printing. The diameter of a human hair ranges from smaller than 0.10 mm to almost 0.20 mm (see, for example, en.wikipedia.org/wiki/hair and www.studybarn.com).

¹⁰ Paul C. Knappenberger and Patrick J. Michaels, *“0.02 C Temperature Rise Averted: The Vital Number Missing from the EPA’s ‘By the Numbers’ Fact Sheet,”* *Cato At Liberty*, June 11, 2014.

¹¹ Anne E. Smith, Ph.D., NERA Economic Consulting, *“Technical Comments on the Regulatory Impact Analysis for the U.S. Environmental Protection Agency’s Proposed Carbon Pollution Emissions Guidelines for Existing Power Plants,”* Prepared on behalf of the Texas Commission on Environmental Quality, November 10, 2014.